WHAT COLOR ARE YOUR M&M'S?

Suggested Grade

4

SD Mathematics Strand & Standard *(Primary for Task)*

Statistics and Probability

4.S.2.1: Students are able to determine the probability of simple events limited to equally likely and not equally likely outcomes.

Task Summary

Students investigate the probability of equally likely or not equally likely.

Time and Context of Task

1-2 class periods

Materials Needed

Small bags of M&M's, graph paper

Author and Lead Teacher for this Task

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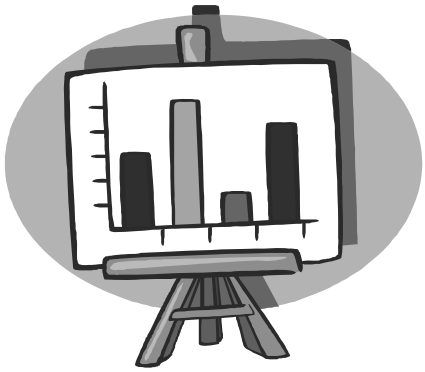
WHAT COLOR ARE YOUR M&M'S?

Follow the teacher created model of a bar graph to create a bar graph of the colors of M&M's in your small bag. Share your graph with your small group. Discuss, as a group each of the colors of M&M's, and whether or not there is one color that appears more. Share your data with the whole class. Add your data to the class data chart on the board.

Independent tasks:
Using the information from the whole class data collection, is there a color that appears most often throughout all of the graphs? Why or why not? What is the probability (equally likely or not equally likely) that every bag purchased of M&M's will produce the same data that was collected by the class? Explain your thinking.



CONTENT STANDARDS

Primary Standard

Strand Name: Statistics and Probability
SD Goal: Students will apply statistical methods to analyze data and explore probability for making decisions and predictions.
Indicator: Apply the concepts of probability to predict outcomes and solve problems.
Standard: 4.S.2.1: Students are able to determine the probability of simple events limited to equally likely and not equally likely outcomes.

Supplemental Standard

Strand Name: Statistics & Probability
SD Goal: Students will apply statistical methods to analyze data and explore probability for making decisions and predictions.
Indicator: Use statistical models to gather, analyze, and display data to draw conclusions.
Standard: 4.S.1.1: Students are able to interpret data from graphical representations and draw conclusions.

NCTM Process Standard

Communication: Organize and consolidate their mathematical thinking through communication.

Problem-Solving Strategies

- Drawing pictures, graphs, and tables
- Use of manipulatives

Assessment Tools

Task Rubric

Standard	Advanced	Proficient	Basic	Below Basic
4.S.2.1: Students are able to determine the probability of simple events limited to equally likely and not equally likely outcomes.	Student's explanation includes the understanding that the probability of the colors of M&M's in each bag is equally likely as not equally likely, and recognizes the fact that each bag is filled randomly with no specific attention paid to the colors present.	Student's explanation includes the understanding that the probability of the color's of M&M's in each bag are equally likely as not equally likely to follow a specific pattern.	Student's explanation recognizes that there is not one color that consistently appears more frequently, but does not show the understanding that each color of M&M's could appear equally likely as not equally likely.	Students does not recognize the fact that each color appears randomly in each bag, and does not use the mathematical terminology of equally likely or not equally likely.
4.S.1.1: Students are able to interpret data from graphical representations and draw conclusions.	Student's mathematical representation of the problem helped clarify the data, which lead to uncovering implied information not readily apparent.	Student's mathematical representation of the problem was appropriate, which lead to a correct solution of the problem.	Student's mathematical representation of the problem has some inaccurate information, and lead to a partially correct solution.	Student's mathematical representation of the problem was incorrect, and lead to an inaccurate conclusion of the problem.
Communication: Organize and consolidate their mathematical thinking through communication.	Student's explanation included an in-depth explanation of reasoning.	Student's explanation was well organized and easy to follow.	Student's explanation was vague in places and inferences had to be made to understand the meaning.	Student's explanation was incomplete, and is unclear or not complete.

Fourth Grade Statistics & Probability
Performance Descriptors

Advanced	**Fourth grade students performing at the advanced level:** • collect data and create a graphical representation; • identify and use median, mode, and range to solve problems; • determine probability of events.
Proficient	**Fourth grade students performing at the proficient level:** • interpret data from graphical representations; • identify median, mode, and range; • determine outcome of events as equally likely and not equally likely.
Basic	**Fourth grade students performing at the basic level:** • answer questions from graphs; • identify mode; • recognize the likelihood of outcomes in simple events.

Fourth Grade Statistics & Probability
ELL Performance Descriptors

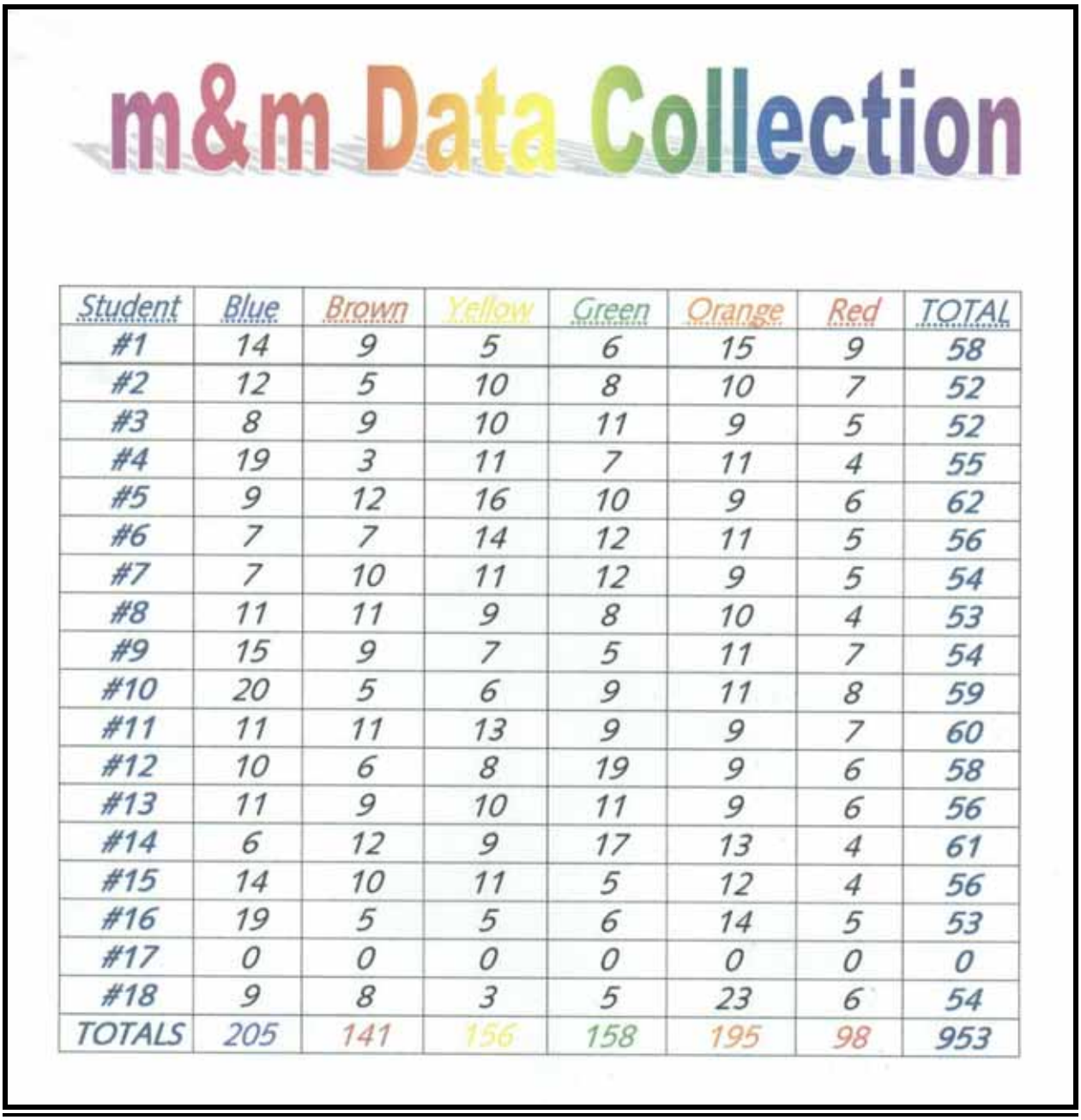
Proficient	**Fourth grade ELL students performing at the proficient level:** • represent data in bar graphs given appropriate scales; • identify mode from a given data set; • determine the probability of events as equally or not equally likely using pictorial representations; • read, write, and speak the language of mathematics.
Intermediate	**Fourth grade ELL students performing at the intermediate level:** • read and answer directed questions from graphs; • determine the probability of events as equally or not equally likely using concrete materials; • answer directed questions from graphs; • explain in mathematical terms the sequence of steps used in solving problems; • give simple oral or written responses to questions on topics presented in class.
Basic	**Fourth grade ELL students performing at the basic level:** • identify mode in data sets; • recognize and use basic statistics and probability terms; • respond to yes or no questions and to problems presented pictorially or numerically in class.
Emergent	**Fourth grade ELL students performing at the emergent level:** • answer directed questions about the data; • imitate pronunciation of statistics and probability terms; • use non-verbal communication to express mathematical ideas.
Pre-emergent	**Fourth grade ELL students performing at the pre-emergent level:** • observe and model appropriate cultural and learning behaviors from peers and adults; • listen to and observe comprehensible instruction and communicate understanding non-verbally.

WHAT COLOR ARE YOUR M&Ms?
Student Work Samples

As you examine the samples, consider the following questions:

- In light of the standard/s addressed and the assessment tools provided, what evidence does the work provide that students are achieving proficiency in the knowledge and skills addressed by the standard/s for the task?
- Is the task/activity well designed to help students acquire knowledge and demonstrate proficiency? Is the task/activity clearly aligned with the standards? In what ways would you adapt the task/activity to better meet the needs of your students?

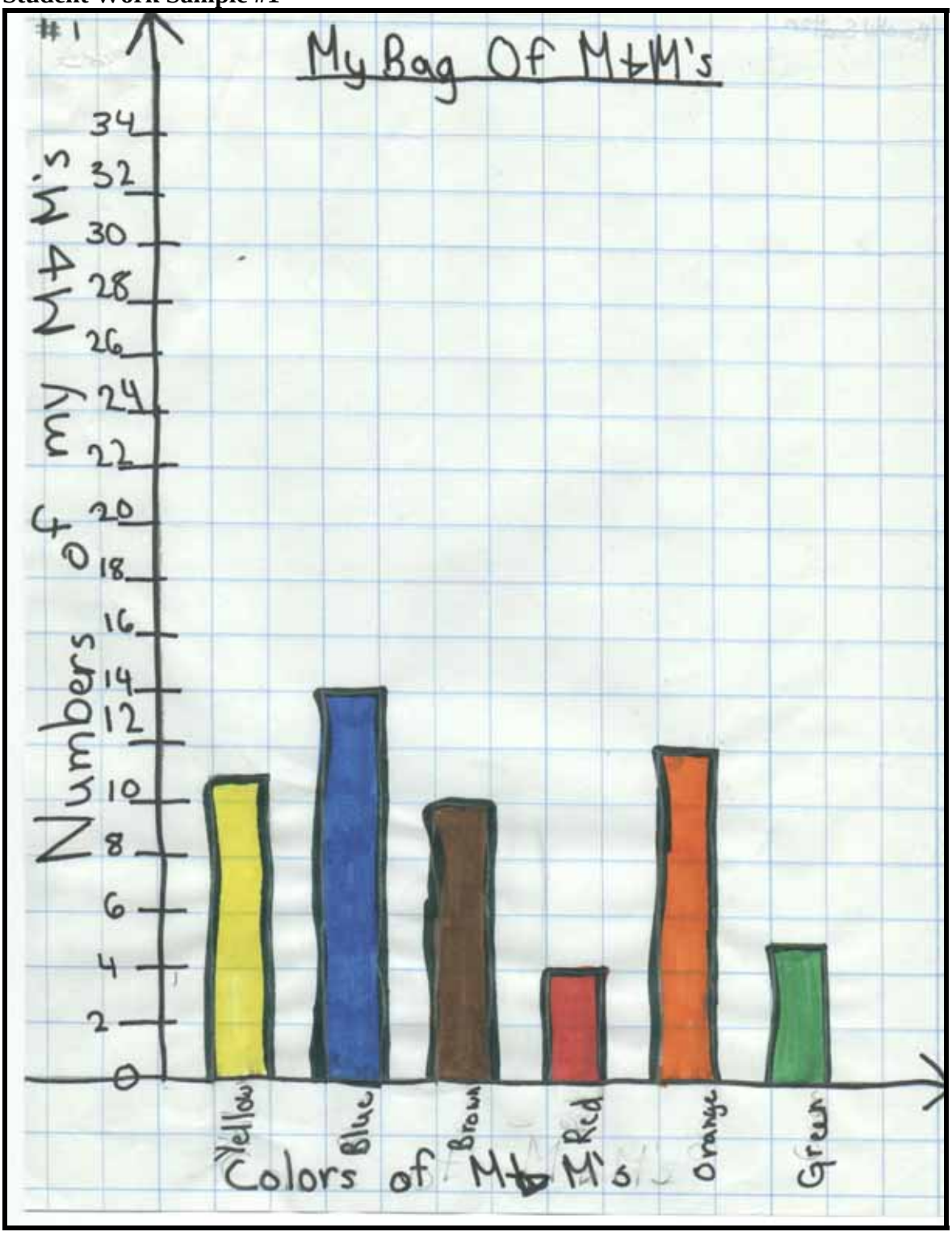
Class Data Set for a Full Bag of M&M Candy



m&m Data Collection

Student	Blue	Brown	Yellow	Green	Orange	Red	TOTAL
#1	14	9	5	6	15	9	58
#2	12	5	10	8	10	7	52
#3	8	9	10	11	9	5	52
#4	19	3	11	7	11	4	55
#5	9	12	16	10	9	6	62
#6	7	7	14	12	11	5	56
#7	7	10	11	12	9	5	54
#8	11	11	9	8	10	4	53
#9	15	9	7	5	11	7	54
#10	20	5	6	9	11	8	59
#11	11	11	13	9	9	7	60
#12	10	6	8	19	9	6	58
#13	11	9	10	11	9	6	56
#14	6	12	9	17	13	4	61
#15	14	10	11	5	12	4	56
#16	19	5	5	6	14	5	53
#17	0	0	0	0	0	0	0
#18	9	8	3	5	23	6	54
TOTALS	205	141	156	158	195	98	953

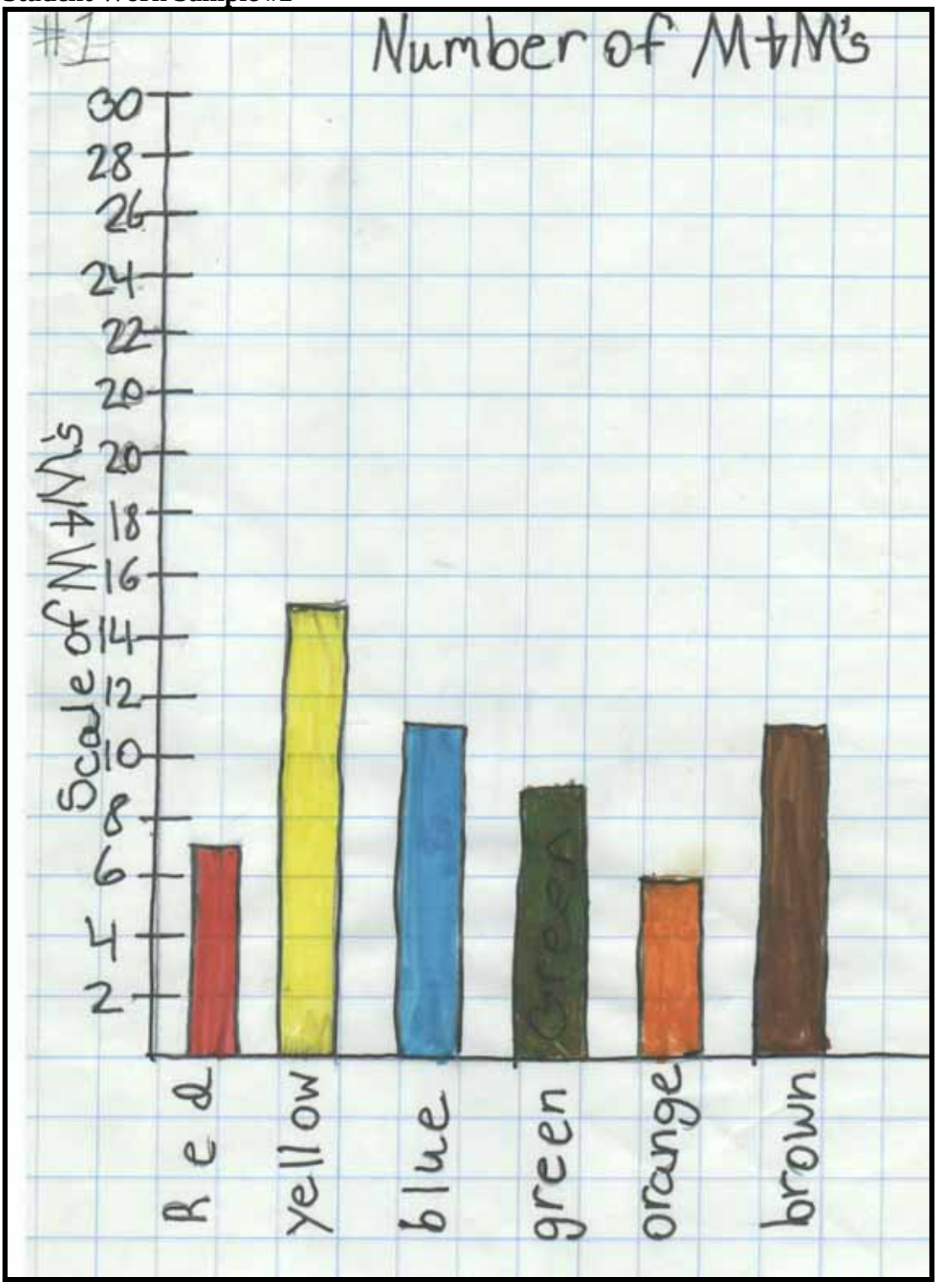
Student Work Sample #1



Looking at Student Work – Instructor notes and rating for work sample #1:

Proficient. Understanding is there, but explanation is not as indepth as advanced.

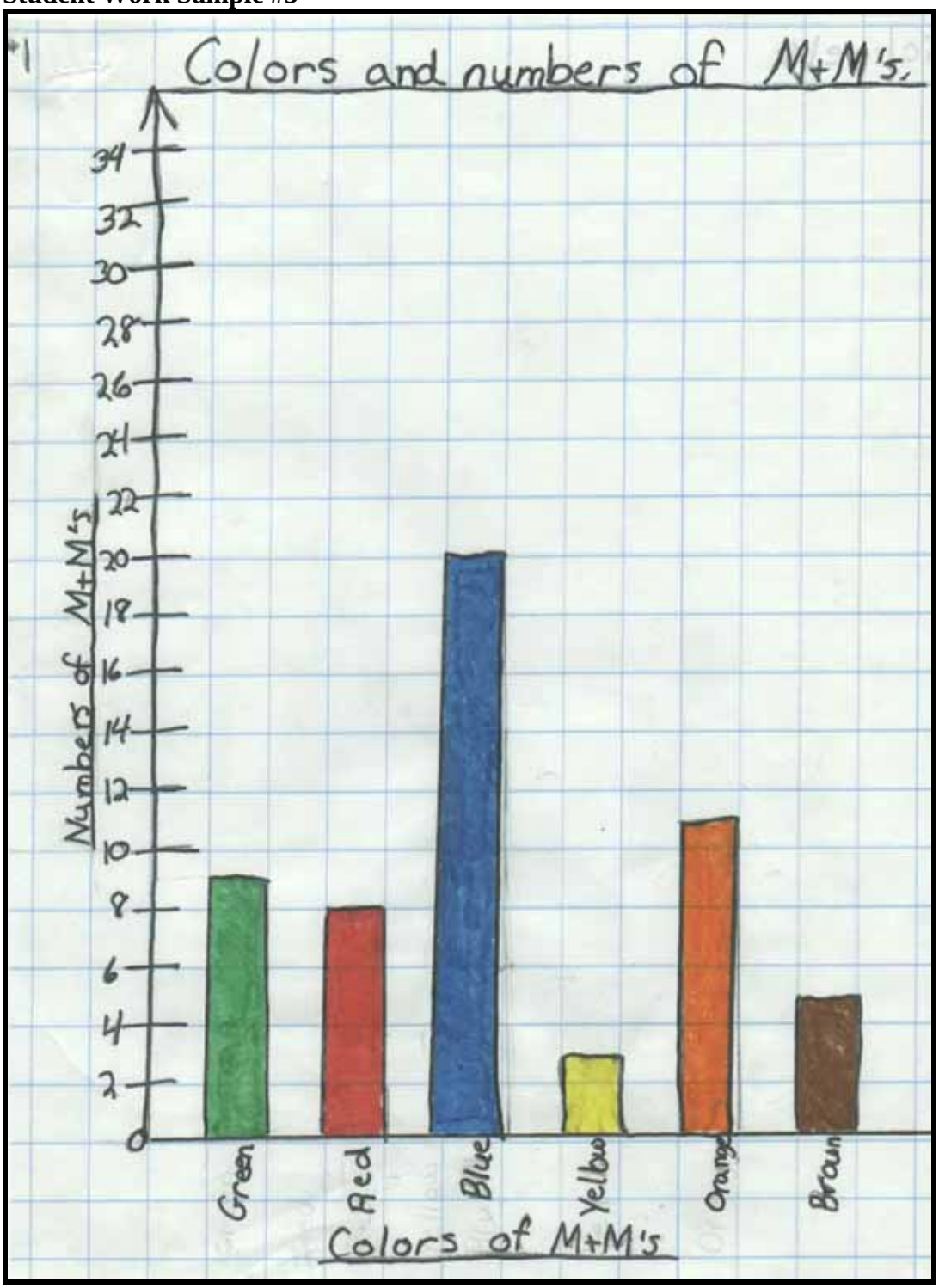
Student Work Sample #2



Looking at Student Work – Instructor notes and rating for work sample #2:

Basic. Response is vague. Student recognizes that one color des not appear more than others, but understanding of equally likely and not equally likely isn't there.

Student Work Sample #3



Looking at Student Work – Instructor notes and rating for work sample #3:

Advanced. Recognizes that M&M bags are filled randomly and that it is equally likely as unlikely that the same color will have more each time.

INSTRUCTIONAL NOTES

Author Comments

Introductory Task

Use the game Red vs. Green found at the http://us.mms.com/us/ web site to help students understand the concept of equally likely. This site contains a game where students chose a color (either red or green) and play a strategy game to try to beat the computer by choosing the correct placement of the M&M's so that at the end of the game the color they chose appears most often. After playing this game a few times, students should be able to discuss the fact that they have an equally likely chance of winning as losing to the computer because there are only two colors to choose from to play this game.

Computer Connection

During whole class data collection, I created a table for students to record their findings on our classroom computer. This allowed students to quickly add their data to the collection. Responses were recorded during and oral conference with the teacher to determine the depth of student understanding.

On-line Link

M&M Brand Home Page at http://us.mms.com/us/

Literature Connections

- M&M Counting Book, Barbara Barbieri McGrath
- Button Box, by Margarette S. Reid, Sarah Chamberlain (Illustrator
- A Pair of Socks, by Stuart J. Murphy, Lois Ehlert (Illustrator

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Resources

SD Mathematics Content Standards
http://www.doe.sd.gov/contentstandards/math/index.asp

SD Assessment and Testing
http://www.doe.sd.gov/octa/assessment/index.asp

The National Assessment of Educational Progress (NAEP)
http://www.doe.sd.gov/octa/assessment/naep/index.asp

National Council of Teachers of Mathematics
http://nctm.org/

Looking at Student Work
http://www.lasw.org/index.html